

## **BPD\_GM01**

### **ES Submission at BP Stage for Non-Residential Buildings**

These ES submission forms/ main forms are to be generated from the ES Online Portal (*previously known as Green Mark (GM) E-filing Portal*). These generated submission forms/ main forms are to be e-signed by the QP and appropriate practitioners before submitting via CORENET.

#### **Sample Forms Attached for Viewing Only**

Applicable for Projects with 1<sup>st</sup> Submission date for URA planning Permission on or after 1 Dec 2021

The forms spell out all the base and carbon reduction measures requirements which QPs and the other practitioners can choose for their design to meet the minimum environmental sustainability standards in complying with the Building Control (Environmental Sustainability) Regulations 2008.

QPs are only required to provide salient information pertaining to the items that are relevant to their design and the ES Online Portal (previously known as Green Mark (GM) E-filing Portal) which compute and perform validation on those items that are required to be complied/selected

In addition:

During Building Plans application stage:

Complete and submit (via CORENET) the template/form on building envelope (e.g. ETTV, RTTV) where relevant

After Building Plans application:

Submit (via CORENET) the air-conditioning information template/form, energy modelling and daylight template/form (where applicable) once the design is firmed up and before installation.

Submittal of the other documents may be required and shall be made in such manner and in such form as the Commissioner of Building Control requires upon request.

For more information: <https://www1.bca.gov.sg/buildsg/sustainability/minimum-environmental-sustainability-standard-for-new-buildings-and-existing-buildings-undergoing-major-additions-and-alterations>

**SUBMISSION OF ENVIRONMENTAL SUSTAINABILITY REQUIREMENTS**  
**Regulation 7 of the Building Control (Environmental Sustainability) Regulations 2008 (Cap. 29)**

Commissioner of Building Control Building & Construction Authority 52 Jurong Gateway Road, #11-01 Singapore 608550	<b>INSTRUCTIONS</b> (1) Please refer to the Explanatory Notes attached before completing these forms via ES Online Portal. (2) Submit one copy of this form together with Form BPD_GM01_Appendix 1 (for residential building) and/or Form BPD_GM01_Appendix 2 (for non-residential building) with the application for approval of building plans.
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**Section I (To be completed by Qualified Person)**

1. I confirm that I have been appointed under section 8(1)(a) or 11(1)(d)(i) of the Building Control Act (Cap 29) as the qualified person in respect of the building works herein described.

Project Reference No.:  GM e-Filing No.:

Description of building works:

2. I hereby declare that the building works or parts thereof assessed are in compliance with the minimum environmental sustainability standard that have met the score of minimum 50 points using the methodology specified in the Code for Environmental Sustainability of Buildings and are as stated in Form BPD\_GM01\_Appendix 1 and/or Form BPD\_GM01\_Appendix 2 where relevant.

Name & Address of Professional Firm	Name & Signature of Qualified Person
Date:	Tel No.:

**Section II (To be completed by Appropriate Practitioners)**

3. We hereby declare that the building works or parts thereof assessed are in compliance with the minimum environmental sustainability standard using the methodology specified in the Code for Environmental Sustainability of Buildings.

Name & Address of Professional Firm	Name & Signature of Practitioner for Mechanical Works
Date:	Tel No.:

Name & Address of Professional Firm	Name & Signature of Practitioner for Electrical Works
Date:	Tel No.:

**ENVIRONMENTAL SUSTAINABILITY REQUIREMENTS FOR NON-RESIDENTIAL BUILDINGS**  
**Regulation 7 of the Building Control (Environmental Sustainability) Regulations 2008 (Cap. 29)**

**SECTION I : SUMMARY**

Project Reference No.:

GM e-Filing No.:

The Gross Floor Area (GFA) for the building works, where applicable:

Building Works	New GFA in m <sup>2</sup>	Existing GFA in m <sup>2</sup> (Major Retrofitting)
Residential		Not Applicable
Non-Residential		
Total		

Pls indicate Non-Residential Floor Area &amp; Percentage (%), where applicable:

Non-Residential Floor Area	Floor Area in m <sup>2</sup>	% Floor Area
Air-conditioned spaces		
Non Air-conditioned spaces		
Total		

(I) Base Requirements	Applicable (Yes/No)	Compliance (Yes/No)
<b>NRB01 Envelope and Roof Thermal Transfer</b>		
NRB01-1 Building Envelope		
NRB01-2 Roof		
(a) Roof with skylights		
(b) Roof without skylights		
<b>NRB02 Air-Tightness and Leakage</b>		
NRB02-1 Windows and Curtain Walls		
(a) Test on air leakage rates based on SS 212 for windows		
(b) Test on air leakage rates based on SS 654 for curtain walls		
NRB02-2 Openings between conditioned and non-conditioned spaces		
(a) Doors equipped with automated technology or self-closing devices with the independent control valve and energy meters		
(b) Equipped with enclosed vestibules or air lock rooms for doorway with high pedestrian traffic flow		
<b>NRB03 Building Energy Performance (Select NRB03-1 or NRB03-2, where applicable)</b>		
NRB03-1 Performance Based Approach via Energy Modelling		
NRB03-2 Energy Performance Standards for Key Building Systems		
(a) Air-Conditioning System		
(i) Water-Cooled Building System		
(ii) Air-Cooled Building System		
• Air-Cooled Chilled Water Plant		
• Unitary Air-Conditioners		
(b) Lighting System		
(c) Mechanical Ventilation System		
(i) Mechanical ventilation system for normally occupied spaces		
(ii) Provision of CO sensors in Carpark Areas		
(d) Vertical Transportation System		

Project Reference No.:		GM e-Filing No.:	
<b>(I) Base Requirements</b>		<b>Applicable</b> (Yes/No)	<b>Compliance</b> (Yes/No)
<b>NRB04 Measurement and Verification (M &amp; V) Instrumentation</b>			
NRB04-1 Instrumentation for Chilled Water Air-Conditioning System			
NRB04-2 Instrumentation for Variable Refrigerant Flow (VRF) System			
<b>NRB05 Electrical Sub-Metering</b>			
<ul style="list-style-type: none"> <li>• Lifts and escalators</li> <li>• Mechanical ventilation system</li> <li>• Centralised hot water supply system</li> <li>• General power supply and lighting systems for tenancy areas and owners' premises</li> </ul>			
<b>NRB06 Maintenance of Building Cooling System Performance</b>			
<b>NRB06-1 Chillers</b>			
Access space provisions are as follows:			
(a) Clear space of 2 m or more at the front of chiller unit piping section			
(b) Clearance of 1.2 m or more between the chillers measured from plinth to plinth		<input type="checkbox"/>	
(c) Overhead service clearance of 1.5 m or more above the chiller		<input type="checkbox"/>	
<b>NRB06-2 Pump Systems</b>			
Access space provisions are as follows:			
(a) Except for the areas where the pipes are connected, a clearance of 0.6 m or more is to be provided round the pump		<input type="checkbox"/>	
(b) Clear head room space of 1 m or more above the pump and motor		<input type="checkbox"/>	
<b>NRB06-3 Cooling Towers</b>			
Maintenance provisions are as follows:			
(a) Provision of maintenance platform, stairs and catwalks of 600 mm width or more with handrails around the cooling towers and access to the level		<input type="checkbox"/>	
(b) Clear space of 2 m or more from the top of cooling towers to location of the trellis, where applicable.		<input type="checkbox"/>	
<b>NRB06-4 Air-Distribution Systems</b>			
(a) Air handling units (AHU) of cooling capacity greater than 35 kW shall be floor mounted as stipulated in SS 553.			
(b) For AHUs that are floor mounted, the access space provisions shall be as follows:			
(i) AHU access – Provide minimum 1m clear space from the AHU room door entrance to the AHU		<input type="checkbox"/>	
(ii) Cooling coil pipe and filter access – Provide minimum 800 mm clear space after pipe connection to facilitate cooling coil cleaning and filter access;		<input type="checkbox"/>	
(iii) Fan access – Provide minimum 800 mm clear space for fan/motor access and maintenance (if the access is not from cooling coil connection side).		<input type="checkbox"/>	
(iv) AHU side and back clearance – Provide minimum 600 mm clear space		<input type="checkbox"/>	

Total no. of compliances:  No. of sustainable attributes that are not applicable:   
 (Total No of compliances + No. of sustainable attributes that are not applicable = 23)



Project Reference No.:		GM e-Filing No.:	
<b>(II) Carbon Reduction Measures:</b> [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]		<b>Selected Options</b> (√ complied)	
<b>Part 1 : Sustainable Design Strategies</b>			
NRBE01-1 Enhanced Building Envelope Performance			
(a) Façade design with ETTV of not more than 40 W/m <sup>2</sup> or or enhanced with provision of good thermal break/Insulating profile framing			
(b) Cool materials that are certified – Minimum coverage of 80% of external walls or roof areas			
(c) Innovative façade technology and solutions for 20% of fenestration areas			
NRBE01-2 Naturally Ventilated Building Design			
(a) Building layout design – Minimum 20% of all units with window openings facing prevailing wind directions			
(b) Natural ventilated design for common areas - Minimum coverage of 80% in at least two (2) common areas			
NRBE01-3 Effective Daylighting			
(a) For normally occupied spaces - Minimum 15% of total occupied areas			
(b) For common areas – Minimum coverage of 80% (by number) in at least two (2) common areas			
(c) Provision of daylight redirecting technologies			
<b>Part 2 : Sustainable Construction</b>			
NRBE02-1 Resource Efficiency Measures			
(a) Existing building structures areas are conserved for adaptive reuse – More than 50% of the floors and/or wall areas			
(b) Concrete Usage Index of no more than 0.50			
(c) Embodied carbon reporting for upfront carbon emission of concrete, steel and glass			
NRBE02-2 Low carbon concrete			
(a) Eco-friendly cement for 80% of superstructural works			
(b) Aggregate replacement that meet minimum usage requirement			
(c) Processed waste for non-structural application			
NRBE02-3 Sustainable Products			
Provision of at least three (3) environmentally friendly products that are certified for 80% of applicable areas or building components.			
<b>Part 3 : Sustainable Technologies</b>			
NRBE03-1 Renewable Energy System			
Minimum 1% reduction in electricity consumption for the building developments			
NRBE03-2 Smart Building Solutions ( <i>Minimum two (2) solutions to comply to this measure</i> )			
(a) Use of BACnet, Modbus or any other open protocol		<input type="checkbox"/>	
(b) Energy management system, applications and dashboard		<input type="checkbox"/>	
(c) Demand controlled ventilation system		<input type="checkbox"/>	
(d) Timer sensors/controls		<input type="checkbox"/>	
(e) Differential pressure monitoring equipment in Air Handling Units (AHUs)		<input type="checkbox"/>	
(f) Others pls state _____ (subject to BCA's clearance)		<input type="checkbox"/>	
NRBE03-3 Green Building Technologies			
• Energy recovery system		<input type="checkbox"/>	
• Lifts with regenerative function		<input type="checkbox"/>	
• Passive displacement ventilation system		<input type="checkbox"/>	
• Hybrid cooling system		<input type="checkbox"/>	
• Smart sensor and control technologies		<input type="checkbox"/>	
• Dedicated outdoor air system		<input type="checkbox"/>	
• Others, pls state _____ (subject to BCA's clearance)		<input type="checkbox"/>	

Total No. of Carbon Reduction Measures: \_\_\_\_\_

No. of Proposed Alternative Solutions: \_\_\_\_\_

SECTION II: SUPPLEMENTARY DETAILS																															
Project Reference No.: _____	GM e-Filing No.: _____																														
<b>(I) Base Requirements</b>	<b>Applicability</b>																														
<b>NRB01 Envelope and Roof Thermal Transfer</b>																															
<b>NRB01-1 Building Envelope</b>																															
<p>(a) The building envelope designed meet the Envelope Thermal Transfer Value (ETTV) of no more than 45 W/m<sup>2</sup> based on the methodology stated in the Code on Envelope Thermal Performance for Buildings and the details are as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th style="width: 15%;">Block No/Ref</th> <th style="width: 25%;">Gross areas of external wall and windows (m<sup>2</sup>)</th> <th style="width: 15%;">Gross Heat Gain (W)</th> <th style="width: 45%;">ETTV, W/m<sup>2</sup> of the respective block</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>ETTV (Weightage Average) for the whole development is _____ W/m<sup>2</sup></p> <p>OR</p> <p>(b) The building envelope is to be designed with the following design parameters with the respective glazing properties.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <thead> <tr> <th style="width: 50%;">Window to Wall Ratio (WWR)</th> <th style="width: 50%;">Shading Coefficients of Glass (SC<sub>glass</sub>)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">&lt;0.20</td><td style="text-align: center;">≤0.51</td></tr> <tr><td style="text-align: center;">0.20 to &lt;0.25</td><td style="text-align: center;">≤0.41</td></tr> <tr><td style="text-align: center;">0.25 to &lt;0.30</td><td style="text-align: center;">≤0.35</td></tr> <tr><td style="text-align: center;">0.30 to &lt;0.35</td><td style="text-align: center;">≤0.30</td></tr> <tr><td style="text-align: center;">0.35 to ≤0.40</td><td style="text-align: center;">≤0.27</td></tr> <tr><td style="text-align: center;">0.40 to ≤0.50</td><td style="text-align: center;">≤0.22</td></tr> </tbody> </table> <p>WWR<sub>bdg devt</sub> = _____</p> <p>Proposed SC<sub>glass</sub> range from _____ to _____</p>	Block No/Ref	Gross areas of external wall and windows (m <sup>2</sup> )	Gross Heat Gain (W)	ETTV, W/m <sup>2</sup> of the respective block													Window to Wall Ratio (WWR)	Shading Coefficients of Glass (SC <sub>glass</sub> )	<0.20	≤0.51	0.20 to <0.25	≤0.41	0.25 to <0.30	≤0.35	0.30 to <0.35	≤0.30	0.35 to ≤0.40	≤0.27	0.40 to ≤0.50	≤0.22	<p><input type="checkbox"/> Yes    <input type="checkbox"/> Complied <input type="checkbox"/> Not Applicable</p> <p>Please select one of the following reasons if this section is not applicable in this development:</p> <ul style="list-style-type: none"> <li>○ All spaces are designed to be non-air-conditioned</li> <li>○ Less than 500sqm of the spaces are designed to be air-conditioned</li> <li>○ This is an underground structure with no façade work</li> </ul>
Block No/Ref	Gross areas of external wall and windows (m <sup>2</sup> )	Gross Heat Gain (W)	ETTV, W/m <sup>2</sup> of the respective block																												
Window to Wall Ratio (WWR)	Shading Coefficients of Glass (SC <sub>glass</sub> )																														
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0.40 to ≤0.50	≤0.22																														

**SECTION II: SUPPLEMENTARY DETAILS**

Project Reference No.:

GM e-Filing No.:

**(I) Base Requirements**

**Applicability**

**NRB01 Envelope and Roof Thermal (cont'd)**

**NRB01-2 Roof**

(a) Roof with Skylights

The roof with skylight is designed with Roof Thermal Transmittance Value (RTTV) of no more than 50 W/m<sup>2</sup> based on the methodology stated in the Code on Envelope Thermal Performance for Buildings

RTTV =  W/m<sup>2</sup>

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:  
 There is no building works on roof

(b) Roof without Skylights

Roof Weight Group	Weight Range (kg/m <sup>2</sup> )	Maximum U-value (W/m <sup>2</sup> k)	U-Value of Roof (W/ m <sup>2</sup> /K)
Light	<50	0.5	<input type="text"/>
Medium	50 to 230	0.8	<input type="text"/>
Heavy	>230	1.2	<input type="text"/>

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:  
 There is no building works on roof

**NRB02 Air-Tightness and Leakage**

**NRB02-1 Windows and Curtain Walls**

Windows and curtain walls shall be designed to ensure that the air leakage rates do not exceed the limits specified in the following standards.

(a) SS 212 – Specification for Aluminium Alloy Windows

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:  
 all spaces are designed to be non-air-conditioned  
 There is no Window in this development

**SECTION II: SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(I) Base Requirements**

**Applicability**

(b) SS 654- Code of Practice for Curtain Walls

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- all spaces are designed to be non-air-conditioned*
- there are no curtain walls in this development*

**NRB02-2 Openings between conditioned and non-conditioned spaces**

Building entrances and door openings to building exterior or non-air-conditioned spaces and the like, shall

- be provided with doors that are equipped with automated technology or self-closing devices with the use of pressure independent control valve and energy meters

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- all spaces are designed to be non-air-conditioned*

- be equipped with vestibules or other appropriate measures for doorway with high pedestrian traffic flow. In the case of vestibules, the interior and exterior door must have a minimum distance of not less than 2.5 m apart and should be interlocked to avoid being opened at the same time.

- Yes*     *Complied*  
 *Not Applicable*

Please state your proposed measures: \_\_\_\_\_

Please select one of the following reasons if this section is not applicable in this development:

- all spaces are designed to be non-air-conditioned*

**SECTION II: SUPPLEMENTARY DETAILS**

Project Reference No.:

GM e-Filing No.:

**(I) Base Requirements**

**Applicability**

**NRB03 Building Energy Performance** (Select NRB03-1 or NRB03-2, where applicable)

**NRB03-1 Performance Based Approach via Energy Modelling**

Demonstration of minimum energy improvements of 50% over 2005 baseline\* via energy modelling and in accordance to the prescribed methodology set out in this Code.

- Yes     Complied  
 Not Applicable

Based on the results of the energy modelling, the Proposed Model is expected to achieve a saving of  % in annual energy consumption compared to the Reference Model.

The details are provided under Section III – Additional Information.

*Note:*

*\*This can be translated to 30% energy savings over current Singapore Standard and baseline*

*The limits set for Total System Efficiency (TSE) of respective building cooling system stipulated under NRB03-2(a) shall apply.*

**NRB03-2 Energy Performance Standards for Key Building Systems**

**NRB03-2(a) Air-Conditioning System**

**(i) Water-Cooled Building Cooling System**

**Water-Cooled Chilled Water Plant (Building System)**

Chiller Plant System Efficiency for water cooled chilled water plant	<input type="text"/>	kW/RT
Total System Efficiency (TSE)	<input type="text"/>	kW/RT

or

**District Cooling System**  
(subject to MEES under EC Act)

Air Distribution System Efficiency	<input type="text"/>	kW/RT
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- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of Water-Cooled Chilled Water Plant or District Cooling System
- Overall Air-Conditioning spaces is less than 500sqm

**(ii) Air-Cooling Building Cooling System**

**Air-Cooled Chilled Water Plant**

Chiller Plant System Efficiency for air-cooled chilled water plant	<input type="text"/>	kW/RT
Total System Efficiency (TSE)	<input type="text"/>	kW/RT

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of Air-Cooled Chilled Water Plant
- Overall Air-Conditioning spaces is less than 500sqm

**SECTION II: SUPPLEMENTARY DETAILS**

Project Reference No.:

GM e-Filing No.:

**(I) Base Requirements**

**Applicability**

**Unitary Air-Conditioners**

Condensing Unit System Efficiency	<input type="text"/>	kW/RT
Total System Efficiency (TSE)	<input type="text"/>	kW/RT

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of Unitary Air-Conditioners*
- Overall Air-Conditioning spaces is less than 500sqm*

**NRB03-2 (b) Lighting System**

Lighting system provision of at least 40% more energy efficient than the prescribed lighting power budget stated in SS530.

Percentage improvement in lighting power budget =  %

Note: Lighting provision for building façade and landscape should comply with the prescribed lighting power budget stated in SS 530, where relevant.

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of lightings in this development*

**NRB01 Building Energy Performance (cont'd)**

**NRB03-2 (c) Mechanical Ventilation System**

(i) Provision of mechanical ventilation system of at least 10% more energy efficient than the prescribed standard stated in SS 553 for normally occupied spaces that utilise mechanical ventilation as the preferred ventilation mode.

Percentage improvement in mechanical ventilation system efficiency =  %

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- Spaces is naturally ventilated*
- There is no mechanical ventilation system for applicable area*

(ii) Provision of Carbon Monoxide (CO) detection sensor control with Variable Speed Drive (VSD) to regulate demand for mechanical ventilation in carpark areas.

- Yes*     *Complied*  
 *Not Applicable*

Please select one of the following reasons if this section is not applicable in this development:

- Carpark is naturally ventilated*
- Carpark not built for this project*

SECTION II: SUPPLEMENTARY DETAILS	
Project Reference No.: _____	GM e-Filing No.: _____
(I) Base Requirements	Applicability
<b>NRB03-2 (d) Vertical Transportation System</b>	
<p>Reduce energy consumption by providing energy efficient vertical transportation systems that are equipped with variable voltage variable frequency (VVVF) drives and sleep mode features and/or standby speed/stop features, where relevant.</p>	<p> <input type="checkbox"/> <i>Yes</i>    <input type="checkbox"/> <i>Complied</i>  <input type="checkbox"/> <i>Not Applicable</i> </p> <p>Please select one of the following reasons if this section is not applicable in this development:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <i>Lift system not provided</i></li> <li><input type="checkbox"/> <i>The use of traction lifts is not suitable for this project'</i></li> </ul>

<b>SECTION II: SUPPLEMENTARY DETAILS</b>	
Project Reference No.: _____	GM e-Filing No.: _____
<b>(I) Base Requirements</b>	<b>Applicability</b>
<b>NRB04 Measurement and Verification (M&amp;V) Instrumentation</b>	
<b>NRB04-1 Instrumentation for Chilled Water System</b>	
Provision of permanent measuring instruments for monitoring of the energy performance of the water-cooled and air-cooled central chilled water plants and air distribution systems.	<input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>Complied</i> <input type="checkbox"/> <i>Not Applicable</i>  Please select one of the following reasons if this section is not applicable in this development: <ul style="list-style-type: none"> <li><input type="radio"/> <i>There is no provision Chilled-Water System in this development.</i></li> </ul>
<b>NRB04-2 Instrumentation for Variable Refrigerant Flow (VRF) System</b>	
Provision of permanent measuring instruments for monitoring of the energy performance of the Variable Refrigerant Flow (VRF) condensing units and air-distribution systems.	<input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>Complied</i> <input type="checkbox"/> <i>Not Applicable</i>  Please select one of the following reasons if this section is not applicable in this development: <ul style="list-style-type: none"> <li><input type="radio"/> <i>There is no provision of Variable Refrigerant Flow (VRF) System</i></li> <li><input type="radio"/> <i>The aggregate conditioned floor area for VRF Systems is less than 2000 m2 or more</i></li> </ul>

**SECTION II: SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(I) Base Requirements**

**Applicability**

**NRB05 Electrical Sub-Metering**

Facilitate measurement and monitoring of major energy end uses for energy management and audit. Separate sub-meters shall be provided and linked to a monitoring system that can measure and trend energy consumption data of the following systems:

Lifts and escalators

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision or replacement of Lift or Escalator*
- There are less than 6 numbers or sets or with sum of all feeders less than or equal to 50 kVA.*
- under public upgrading programmes*

Mechanical Ventilation Systems

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of Mechanical Ventilation Systems*
- The total subsystem's load <= 15 kW*

Centralised hot water supply system

- Yes     Complied  
 Not Applicable

Please select one of the following reasons if this section is not applicable in this development:

- There is no provision of Centralised hot water supply system*
- <= 50kW Thermal heating capacity*

<b>SECTION II: SUPPLEMENTARY DETAILS</b>	
Project Reference No.: <span style="border: 1px solid black; display: inline-block; width: 150px; height: 15px; background-color: #e0e0e0;"></span>	GM e-Filing No.: <span style="border: 1px solid black; display: inline-block; width: 150px; height: 15px; background-color: #e0e0e0;"></span>
<b>(I) Base Requirements</b>	<b>Applicability</b>
<p>General power supply and lighting systems for tenancy areas and owners' premises</p>	<p> <input type="checkbox"/> <i>Yes</i>    <input type="checkbox"/> <i>Complied</i>  <input type="checkbox"/> <i>Not Applicable</i> </p> <p>Please select one of the following reasons if this section is not applicable in this development:</p> <ul style="list-style-type: none"> <li><input type="radio"/> <i>A &amp; A works with no addition/change in general power supply or lighting systems</i></li> <li><input type="radio"/> <i>under public upgrading programmes</i></li> </ul>

SECTION II: SUPPLEMENTARY DETAILS	
Project Reference No.: _____	GM e-Filing No.: _____
(I) Base Requirements	Applicability
<b>NRB06 Maintenance of Building Cooling System Performance</b>	
To ensure adequate service clearances so that the building cooling system performance can be maintained during operation as designed. Service clearances are to be provided as per manufacturers' specification or prescribed standards stated in the following clauses, whichever governs.	
"For existing building project, this indicator can be considered as an alternative solution under carbon reduction measures (sustainable design strategies) if it meets the requirement"	
<b>NRB06-1 Chillers</b>	
Access space provisions are as follows:	<input type="checkbox"/> Yes <input type="checkbox"/> Complied <input type="checkbox"/> Not Applicable
<input type="checkbox"/> (a) Clear space of 2 m or more at the front of chiller unit piping section for tube maintenance and cleaning, repair and replacement of bigger components	Please select one of the following reasons if this section is not applicable in this development: <ul style="list-style-type: none"> <li>○ <i>There is no provision or replacement of Chillers</i></li> </ul>
<input type="checkbox"/> (b) Clearance of 1.2 m or more between the chillers measured from plinth to plinth for regular maintenance.	
<input type="checkbox"/> (c) Clearance of 1.5 m or more above the chiller for maintenance, overhaul or replacement.	
<b>NRB06-2 Pump Systems</b>	
Access space provisions are as follows:	<input type="checkbox"/> Yes <input type="checkbox"/> Complied <input type="checkbox"/> Not Applicable
<input type="checkbox"/> (a) Except for the areas where the pipes are connected, a clearance of 0.6 m or more is to be provided round the pump for regular maintenance.	Please select one of the following reasons if this section is not applicable in this development: <ul style="list-style-type: none"> <li>○ <i>There is no provision or replacement Pump Systems</i></li> </ul>
<input type="checkbox"/> (b) Clear head room space of 1 m or more above the pump and motor to facilitate overhaul maintenance or replacement	
<b>NRB06-3 Cooling Towers</b>	
Maintenance provisions are as follows:	<input type="checkbox"/> Yes <input type="checkbox"/> Complied <input type="checkbox"/> Not Applicable
<input type="checkbox"/> (a) Provision of maintenance platform, stairs and catwalks of 600 mm width or more with handrails around the cooling towers and access to the level for periodic maintenance, inspection of water basin and fill media.	Please select one of the following reasons if this section is not applicable in this development: <ul style="list-style-type: none"> <li>○ <i>There is no provision or replacement of Cooling Towers</i></li> </ul>
<input type="checkbox"/> (b) Clear space of 2 m or more from the top of cooling towers to location of the trellis, where applicable.	

<b>SECTION II: SUPPLEMENTARY DETAILS</b>									
Project Reference No.: _____	GM e-Filing No.: _____								
<b>(I) Base Requirements</b>	<b>Applicability</b>								
<b>NRB06 Maintenance of Building Cooling System Performance</b>									
<b>NRB06-4 Air-Distribution Systems</b>									
<p>(a) Air handling units (AHU) of cooling capacity greater than 35 kW shall be floor mounted as stipulated in SS 553.</p> <p>(b) For AHUs that are floor mounted, the access space provisions shall be as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 20px; text-align: center; vertical-align: top;"><input type="checkbox"/></td> <td style="padding: 5px;">(i) AHU access – Provide minimum 1.0 m clearance from the AHU room door entrance to the AHU for general maintenance;</td> </tr> <tr> <td style="width: 20px; text-align: center; vertical-align: top;"><input type="checkbox"/></td> <td style="padding: 5px;">(ii) Cooling coil pipe and filter access – Provide minimum 800 mm clearance after pipe connection to facilitate cooling coil cleaning and filter access;</td> </tr> <tr> <td style="width: 20px; text-align: center; vertical-align: top;"><input type="checkbox"/></td> <td style="padding: 5px;">(iii) Fan access – Provide minimum 800 mm clearance for fan/motor access and maintenance (if the access is not from the cooling coil connection side); and</td> </tr> <tr> <td style="width: 20px; text-align: center; vertical-align: top;"><input type="checkbox"/></td> <td style="padding: 5px;">(iv) AHU side and back clearance – Provide minimum 600 mm clear width for general access and maintenance.</td> </tr> </table>	<input type="checkbox"/>	(i) AHU access – Provide minimum 1.0 m clearance from the AHU room door entrance to the AHU for general maintenance;	<input type="checkbox"/>	(ii) Cooling coil pipe and filter access – Provide minimum 800 mm clearance after pipe connection to facilitate cooling coil cleaning and filter access;	<input type="checkbox"/>	(iii) Fan access – Provide minimum 800 mm clearance for fan/motor access and maintenance (if the access is not from the cooling coil connection side); and	<input type="checkbox"/>	(iv) AHU side and back clearance – Provide minimum 600 mm clear width for general access and maintenance.	<p style="text-align: right;"> <input type="checkbox"/> <i>Yes</i>    <input type="checkbox"/> <i>Complied</i>  <input type="checkbox"/> <i>Not Applicable</i> </p> <p><i>Please select one of the following reasons if this section is not applicable in this development:</i></p> <ul style="list-style-type: none"> <li>○ <i>There is no provision or of Air-Distribution Systems replacement of AHUs with cooling capacity greater than 35kW</i></li> </ul> <p style="text-align: right; margin-top: 20px;"> <input type="checkbox"/> <i>Yes</i>    <input type="checkbox"/> <i>Complied</i>  <input type="checkbox"/> <i>Not Applicable</i> </p> <p><i>Please select one of the following reasons if this section is not applicable in this development:</i></p> <ul style="list-style-type: none"> <li>○ <i>There is no provision or of Air-Distribution Systems replacement of AHUs</i></li> <li>○ <i>The cooling capacity of the AHU is not greater than 35kW</i></li> <li>○ <i>AHUs are not floor mounted. Please state the reasons:</i> _____</li> <li>○ <i>This project is an existing building development with major A&amp;A and /or retrofit.</i></li> </ul>
<input type="checkbox"/>	(i) AHU access – Provide minimum 1.0 m clearance from the AHU room door entrance to the AHU for general maintenance;								
<input type="checkbox"/>	(ii) Cooling coil pipe and filter access – Provide minimum 800 mm clearance after pipe connection to facilitate cooling coil cleaning and filter access;								
<input type="checkbox"/>	(iii) Fan access – Provide minimum 800 mm clearance for fan/motor access and maintenance (if the access is not from the cooling coil connection side); and								
<input type="checkbox"/>	(iv) AHU side and back clearance – Provide minimum 600 mm clear width for general access and maintenance.								

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 1: Sustainable Design Strategies**

**NRBE01-1 Enhanced Building Envelope Performance**

(a) The building envelope is designed with Envelope Thermal Transmittance Value (ETTV) of no more than 40 W/m<sup>2</sup> based on the methodology stated in the Code on Envelope Thermal Performance for Buildings or enhanced with provision of good thermal break/Insulating profile framing

ETTV = \_\_\_\_\_ W/m<sup>2</sup>

Enhanced with provision of good thermal break/insulating profile framing

- Selected Option
- Complied

(b) Application of cool materials that are certified by an approved local certification body for 80% of all external wall or roof areas

Locations	Total Area, in m <sup>2</sup>	Total Non-Applicable Area in m <sup>2</sup>	Total Applicable Area in m <sup>2</sup>	Total Areas with cool materials in m <sup>2</sup>	Extent of Coverage in %
External Wall Areas					
Main building blocks					
OR					
Roof Areas					
Main building blocks					
Carparks					
<p><i>Note: Non-applicable areas can include green roofs and areas beneath large equipment such as water tanks or photovoltaic (PV) panels where the application of cool materials may not be relevant.</i></p>					

- Selected Option
- Complied

Extent of Coverage: Total Areas with cool materials/ Total Applicable Areas

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.:

GM e-Filing No.:

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 1: Sustainable Design Strategies**

Part 2: Sustainable Construction

(c) Provision of innovative façade technology or solutions such as the use of electrochromic glass, integration of photovoltaic modules, parametric façade and so on for at least 20% of the fenestration areas

Total fenestration areas (in m<sup>2</sup>) =

- Selected Option
- Complied

Technology or solution used fenestration Area, in m <sup>2</sup>	
Electrochromic glass	<input type="text"/>
Integration of photovoltaic modules	<input type="text"/>
Parametric facade	<input type="text"/>
Others (pls state) _____ (Subject to BCA's clearance)	<input type="text"/>
Total fenestration areas with innovative solutions	<input type="text"/>
Percentage % of fenestration that meet the requirements	<input type="text"/>

**NRBE01-2 Naturally Ventilated Building Design**

Enhance indoor thermal comfort through the provision of building layout design which facilitate good natural ventilation

(a) Building layout design comprises 20% of all normally occupied spaces with openings facing prevailing wind directions

- Selected Option
- Complied

Total nos. of units/rooms in the development	Units/Rooms with openings facing prevailing north and south directions	
	Total No.	Percentage
<input type="text"/>	<input type="text"/>	<input type="text"/>

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 1: Sustainable Design Strategies**

(b) Design for natural ventilation with minimum coverage of 80% in at least two (2) of the following areas

- Lift Lobbies
- Corridors
- Staircases
- Carpark
- Atrium
- Toilets

- Selected Option*
- Complied*

**NRBE01-3 Effective Daylighting**

Encourage the provision of effective natural lighting for better visual comfort.

(a) Normally occupied spaces: Daylighting provision with desired lighting level and specific Daylight Autonomy (DA) requirements as outlined in the following table for a minimum 15% of total occupied areas using the daylighting availability tables provided. The provision must come with integration of daylighting controls.

Total occupied areas (m <sup>2</sup> )	
Total Area meeting daylight requirement (m <sup>2</sup> )	
% of total occupied areas with effective daylighting (%)	

- Selected Option*
- Complied*

(b) Common Areas: Daylighting provision with integrated daylight controls for a minimum coverage of 80% (by number) in at least two (2) of the following areas

- Lift Lobbies
- Corridors
- Staircases
- Carpark
- Atrium
- Toilets

- Selected Option*
- Complied*

<b>SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS</b>	
Project Reference No.: _____	GM e-Filing No.: _____
<b>(II) Carbon Reduction Measures</b> [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]	
<b>Part 1: Sustainable Design Strategies</b>	
<p>(c) Provision of daylight redirecting technologies such as light shelves or tubular daylight to enhance lighting level.</p> <p><input type="checkbox"/> Light Shelves</p> <p><input type="checkbox"/> Tubular daylight</p> <p><input type="checkbox"/> Others (please specify):            _____            (to be evaluated on a case to case basis)</p>	<p><input type="checkbox"/> <i>Selected Option</i></p> <p><input type="checkbox"/> <i>Complied</i></p>

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.:

GM e-Filing No.:

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 2: Sustainable Construction**

**NRBE02-1 Resource Efficiency Measures**

Design and practices that optimises resource efficiency in building construction

- (a) Existing structures with more than 50% of floor and / or wall areas are conserved for adaptive reuse

- Selected Option
- Complied

% conserved and/or adapted for reuse	<input type="text"/>
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- (b) Design with Concrete Usage Index (CUI) of not more than 0.50

- Selected Option
- Complied

Concrete Volume in m <sup>3</sup> (A)	<input type="text"/>
Total Constructed Floor Area in m <sup>2</sup> (B)	<input type="text"/>
Project Concrete Usage Index (CUI), C = A/B)	<input type="text"/>

- (c) Embodied carbon reporting to account for the upfront carbon emissions of three (3) key construction materials namely, concrete, steel and glass used in building developments.

- Selected Option
- Complied

**NRBE02-2 Low Carbon Concrete**

Use of sustainable materials for construction

- (a) Eco-friendly cement used:
  - Use of concrete up to grade C50/60) with eco-friendly cementitious materials that are classified under CEM II to V types for at least 80% of the super-structural works by volume
  - or
  - Used of certified concrete for 80% of the super-structural works

- Selected Option
- Complied

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 2: Sustainable Construction**

(a) Aggregate replacement: Use of recycled concrete aggregate (RCA), washed copper slag (WCS) and/or granite fines from approved sources that meet the minimum usage requirement (that is 1.5% x GFA for RCA or granite fines and/or 0.75 x GFA for WCS)

- Selected Option
- Complied

GFA = \_\_\_\_\_ m<sup>2</sup>

	Minimum requirement (tons) based on GFA	Tonnage used	Meet Minimum Usage (Yes/No)
RCA used	<system compute; 1.5/100*GFA>		
WCS used	<system compute; 0.75/100*GFA>		
Granite fines used	<system compute; 1.5/100*GFA>		

(b) Alternative construction materials that can be used as a replacement for standard building materials for non-structural application

- Selected Option
- Complied

Please state the alternative construction materials used: \_\_\_\_\_

Area of Application:

- Footpath
- Road Construction
- Concrete bench for parks
- Pavement
- Others (please specify): \_\_\_\_\_

**NRBE02-3 Sustainable Products**

Minimum provision of three (3) environmentally friendly products that are certified with Environmental Product Declaration (EPD) requirements or two-ticks rating by an approved local certification body for 80% of the applicable areas or building components

- Selected Option
- Complied

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 3: Sustainable Technologies**

**NRBE03-1 Renewable Energy System**

Encourage the use of on-site renewable energy sources to reduce the use of electricity by at least 1% of the expected total building electricity consumption.

Renewable energy sources include the following:

Photovoltaic (PV) System (a)	kWp
Expected electricity generated by PV system (b)	kWh/year
Expected total building electricity consumption (c)	kWh/year
Percentage of replacement of electricity by renewable energy (based on total electricity consumption) (d) = (b)/ (c)*100	%

- Selected Option
- Complied

**NRBE03-2 Smart Building Solutions**

Encourage the provision of minimum two (2) building solutions which facilitates some form of automation and controls over building systems for better energy management and thermal comfort as listed

- (a) Use of BACnet, Modbus or any other open protocol as the network backbone of the building management system where data points can be used to facilitate communication and integration with other building systems.
- (b) Energy management system, applications and dashboard that help building owners and/or tenants to better manage their energy consumption in an intuitive manner
- (c) Demand controlled ventilation system such as carbon dioxide sensors or devices to regulate the fresh air intake and ventilation based on occupants' need.
- (d) Timer sensors/controls for lighting and ventilation systems in common areas and facilities
- (e) Smart Building sensors that are equipped with sensing capability, microprocessors and communication technology
- (f) Differential pressure monitoring switches in Air Handling Units (AHUs)
- (g) Others (1): (please specify): \_\_\_\_\_  
(to be evaluated on a case to case basis)
- (h) Others (2): (please specify): \_\_\_\_\_  
(to be evaluated on a case to case basis)

- Selected Option
- Complied

**SECTION II: DESIGN SUBMISSION – SUPPLEMENTARY DETAILS**

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**(II) Carbon Reduction Measures** [Select four (4) carbon reduction measures from 3 Parts including a minimum of 2 measures from Part 2- Sustainable Construction]

**Part 3: Sustainable Technologies**

**NRBE03-3**

**Green Building Technologies**

Adoption of low-carbon solutions and technologies which help reduce energy consumption.

Examples of the systems that can be considered:

- (i) Energy recovery system
- (ii) Lifts with regenerative function
- (iii) Passive displacement ventilation system
- (iv) Hybrid cooling system
- (v) Smart sensor and control technologies
- (vi) Dedicated outdoor air system
- (vii) Others: (please specify): \_\_\_\_\_  
(to be evaluated on a case to case basis)

- Selected Option*
- Complied*

Project Reference No.:

GM e-Filing No.:

**SECTION III: ADDITIONAL INFORMATION****(I) Summary of Energy Modelling Results and Design Information under NRB03-1 and NRB03-2****(i) Water-Cooled Building Cooling System**

<b>Design Information</b>			
Type of Air-Conditioners	<b>Water-Cooled Chilled Water Plant (Building System)</b>	<b>District Cooling System (DCS)</b> - subject to MEES under EC Act	
Air-Conditioned Spaces served by this system			m <sup>2</sup>
Peak Building Cooling Load			RT
Chilled Water Supply Temperature (CHWS)			°C
Total Installed Capacity (Including Standby)			RT
Year Installed (Existing Chiller)			
<b>Design System Efficiency</b>			
Chiller Efficiency			kW/RT
Chiller Plant System Efficiency			kW/RT
Air Distribution System Efficiency			kW/RT
			W/CMH
Total System Efficiency (TSE)			kW/RT

**(i) Air-Cooling Building Cooling System**

Applicable to air-cooled chilled-water plant for Existing Buildings with peak building cooling load of not more than 500 RT and unitary air conditioners

<b>Design Information</b>			
Type of Air-Conditioners	<b>Air-Cooled Chilled Water Plant</b>	<b>Unitary Air-Conditioners</b>	
Air-Conditioned Spaces served by this system			m <sup>2</sup>
Peak Building Cooling Load			RT
Total Installed Capacity (Including Standby)			RT
For air-cooled chilled water plant ( $\leq$ 500RT) Chilled Water Supply Temperature (CHWS)			°C
<b>Design System Efficiency</b>			
Condensing Unit System Efficiency			kW/RT
Chiller Efficiency of air-cooled chilled water plant			kW/RT
Chiller Plant System Efficiency for air-cooled chilled water plant			kW/RT
Air Distribution System Efficiency			kW/RT
			W/CMH
Total System Efficiency (TSE)			kW/RT

Project Reference No.: \_\_\_\_\_

GM e-Filing No.: \_\_\_\_\_

**SECTION III: ADDITIONAL INFORMATION****(II) Summary of Energy Modelling Results and Design Information under NRB03-1**

<b>Other Energy System (Saving from baseline model)</b>		
Energy in Water-Cooled Chilled Water Plant over baseline model		%
Energy in Air-Cooled Chilled Water Plant over baseline model		%
Energy in Unitary Air-Conditioners over baseline model		%
Energy saving in Lighting System over baseline model		%
Energy saving in mechanical ventilation system (General) over baseline model		%
Percentage improvement in mechanical ventilation system (Carpark) over baseline model		%

Renewable Energy (Capacity)		kWp
Renewable Energy (Energy Replacement)		%
Energy Saving on Demand Control (motion sensor, photo sensor, CO sensor)		%
Total Energy Building Consumption (TEBC)		kWh/year
Data centre Energy Consumption (DCEC)		kWh/year
Carpark Area		m <sup>2</sup>
Data Centre area (DCA)		m <sup>2</sup>
Gross Lettable Area (GLA)		m <sup>2</sup>
Weighted Floor Vacancy Rate of gross lettable areas (VCR)		%
Typical weekly Operating hours of office buildings in Singapore (55)		hrs/week
Weighted Weekly Operating Hours of Gross Lettable Area exclusive of data Centre Area (OH)		hrs/week
EUI [Total Energy Building Consumption (TEBC) /GFA]		kWh/m <sup>2</sup> /yr

Regenerative lift	Yes	No
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**(III) Summary of Sustainable Products used in NRBE02-3**

## List of Sustainable Products

S/No.	Description of environmentally friendly products	Certification Type (EPD/SGBC 2 Ticks)	Applicable areas or building Components	Extent of Coverage (%)
1				
2				
3				
4				
5				

(minimum 3 product categories for 80% of applicable areas or building components)